1 Simplify:

a $(3\sqrt{2})^2$ **b** $-2\sqrt{3} \times 4\sqrt{3}$ **c** $3\sqrt{2} - \sqrt{8}$

d $(\sqrt[3]{-27})^3$ **e** $(5\sqrt{3})^3 \times (\sqrt{2})^4$ **f** $\sqrt{\frac{81}{256}}$

2 Write in simplest radical form:

a $\sqrt{48}$ **b** $\sqrt{864}$

3 Simplify:

a $2\sqrt{3} + 6\sqrt{5} - 3\sqrt{3} - 4\sqrt{5}$ **b** $\frac{\sqrt{6}}{3} - \frac{\sqrt{6}}{4} + \frac{2\sqrt{6}}{5}$

4 Expand and simplify:

a $2\sqrt{3}(4 - \sqrt{3})$ **b** $(3 - \sqrt{7})^2$ **c** $(2 - \sqrt{3})(2 + \sqrt{3})$

d $(3 + 2\sqrt{5})(2 - \sqrt{5})$ **e** $(4 - \sqrt{2})(3 + 2\sqrt{2})$ **f** $(\sqrt{7} + 3\sqrt{8})^2$

5 Express with integer denominator:

a $\frac{8}{\sqrt{2}}$ **b** $\frac{15}{\sqrt{3}}$ **c** $\frac{\sqrt{3}}{4 + \sqrt{2}}$ **d** $\frac{5}{6 - 2\sqrt{3}}$

6 Write $\sqrt{\frac{1}{7}}$ in the form $k\sqrt{7}$.

7 Use the binomial expansion for $(a+b)^3$ to write $(5+\sqrt{2})^3$ in the form $a+b\sqrt{2}$ where $a, b \in \mathbb{Z}$.

8 Write in the form $a+b\sqrt{3}$ where $a, b \in \mathbb{Q}$:

a $\dfrac{\frac{\sqrt{3}}{2}+1}{1-\frac{\sqrt{3}}{2}}$

b $\dfrac{2+\sqrt{3}}{2-\sqrt{3}} - \dfrac{2\sqrt{3}}{2+\sqrt{3}}$

9 Write with integer denominator: $\dfrac{2\sqrt{5}-\sqrt{7}}{\sqrt{5}+2\sqrt{7}}$

10 Find $x, y \in \mathbb{Q}$ such that $(3+x\sqrt{5})(\sqrt{5}-y) = -13+5\sqrt{5}$.

1 **a** 18 **b** -24 **c** $\sqrt{2}$ **d** -27 **e** $1500\sqrt{3}$ **f** $\frac{9}{16}$

2 **a** $4\sqrt{3}$ **b** $12\sqrt{6}$ **3** **a** $2\sqrt{5}-\sqrt{3}$ **b** $\frac{29\sqrt{6}}{60}$

4 **a** $8\sqrt{3}-6$ **b** $16-6\sqrt{7}$ **c** 1 **d** $\sqrt{5}-4$
e $8+5\sqrt{2}$ **f** $79+12\sqrt{14}$

5 **a** $4\sqrt{2}$ **b** $5\sqrt{3}$ **c** $\dfrac{4\sqrt{3}-\sqrt{6}}{14}$ **d** $\dfrac{15+5\sqrt{3}}{12}$

6 $\frac{1}{7}\sqrt{7}$ **7** $155+77\sqrt{2}$ **8** **a** $7+4\sqrt{3}$ **b** 13

9 $\dfrac{-24+5\sqrt{35}}{23}$ **10** $x=-2,\ y=1$ or $x=-\frac{3}{5},\ y=\frac{10}{3}$